

pimelic acid, suberic acid, azelaic acid, a cyclic anhydride or an alkyl derivative thereof, or trimellitic anhydride.

- B4
cont'd
24. (New) The refrigerant composition according to claim 23, wherein the cyclic anhydride is succinic anhydride.
25. (New) The refrigerant composition according to claim 21, wherein the molar ratio between the mono- and dibasic carboxylic acids is 50:50 to 95:5.
26. (New) The refrigerant composition according to claim 17, wherein the fluorinated hydrocarbon based refrigerant is hydrofluorocarbon 134, hydrofluorocarbon 134a, hydrofluorocarbon 143, hydrofluorocarbon 143a, hydrofluorocarbon 152, hydrofluorocarbon 152a or a mixture thereof.

REMARKS

Restriction Requirement

Applicants provisionally elected to prosecute the claims of Group I, namely claims 1-9, during a telephone conversation with the Examiner on November 20, 2000. Applicants hereby affirm the election to prosecute the claims of Group I and have cancelled claims 10-15. Applicants reserve the right to pursue claims 10-15 in a divisional application.

Status of the Claims

Claim 7 has been amended to remove the objectionable phrase "such as" and the subject matter therein has been incorporated in new claim 16. Claims 8 and 9 have been amended to remove the improper multiple dependency. New claims 17-26 have been added. Support for new claims 17-26 may be found in pending claims 1-9. No new matter has been added.

The Examiner has also requested that certain language used in claim 1 be clarified. Specifically, the Examiner points to the use of "of an ester" on line 3 of claim 1. This term has been removed per the Examiner's suggestion. Next, the Examiner questioned the phrase "at least 50% of the polyol residue" on lines 7 and 8 of claim 1. The refrigerant claimed in claim 1 is a mixture of esters, specifically HPHP and one

of the three options presented in the claim. In the first option presented on lines 7 and 8, HPHP is at least 50 mol% of the polyol residue (i.e. trimethylol propane, trimethylol ethane, pentaerythritol or 2,2,4-trimethylpentadiol) in the ester mixture. As such, we do not believe that any further amendment to the claim is required. The Examiner has also suggested that the term “ester” be inserted after “1,3-propanediol”. A reading of the second option reveals that the ester to be mixed with HPHP is 2-butyl-2-ethyl-1,3-propanediol. Therefore, we do not believe that the insertion of the term “ester” after “1,3-propanediol” is necessary. The Examiner also states that the third option of claim 1 is indefinite for failing to define the molar ratio of the esters. Applicants contend that the lack of a molar ratio in the third option does not render it indefinite. The mixture of HPHP and NPG, 2-ethyl-1,3-hexanediol or 1,4-dimethylol-cyclohexane can be in any proportion. Finally, the Examiner has requested clarification of the term “in situ” in claim 2. This term is defined on page 3 of the Specification and means that the mixing of the polyols and the esterification of the resulting mixture is performed in the same vessel.

Rejections Under 35 USC §112, second paragraph

The Examiner has rejected claims 1-7 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner has rejected these claims for lack of proper antecedent basis and for the use of the phrase “such as”. Applicants respectfully traverse these rejections. The claims currently under consideration are the claims submitted in Applicants’ PCT application and therefore were drafted in accordance with PCT practice. Although these claims may not conform to US format or practice, Applicants submit that the particular claim language used does not render the claims indefinite under the standards of 35 USC §112, second paragraph. Applicants have now modified the claims to comply with US practice. Claim 1 has been amended to more clearly define the invention in accordance with the Examiner’s suggestions. Claim 7 has been amended to remove the phrase “such as”. However, Applicants submit that these changes and the creation of a new dependent claim does not serve to narrow the scope or otherwise limit the claims, but merely serves to place the claims in better form for purposes of US examination. Applicants respectfully request reconsideration and removal of the rejections.

Rejections Under 35 USC §102(b)

The Examiner has rejected claims 1-7 under 35 USC §102(b) as being anticipated by Nakahara et al. (US Pat. No. 5,374,366). The Examiner argues that Example 10 of Nakahara anticipates the instant

invention. The Examiner states that Nakahara uses HPHP as its initial component and reacts the HPHP with a mixture of neopentylglycol (NPG) and succinic acid, caproic acid and 2-ethylhexanoic acid thereby reading on claims 3, 5, 6 and 7 of the instant invention. Applicants respectfully traverse. Applicants' claimed refrigeration composition differs from Reaction Product J of Nakahara, both in its composition and in the method in which it is made.

The novel complex esters of the present invention comprise complex esters of 3-hydroxy-2,2-dimethyl-propyl-3-hydroxy-2,2-dimethylpropionate which contain residues of both mono- and dibasic carboxylic acids, the molar ratio between the mono- and dibasic carboxylic acid residues in the ester being 50:50 to 95:5. The complex esters of the instant invention are produced in a single step in one "pot" with HPHP as a starting material. In contrast, Nakahara uses a multi-step process to produce its reaction product as can be seen in Examples 1 and 10 of Nakahara. The structure of the units obtained by pre-esterification of hydroxypivalic acid with neopentylglycol (NPG) are different from the structure of the present esterified HPHP as seen from the high ratio of NPG to acid in Nakahara.

Claims 2 and 18 of the present invention clearly describes the preparation of the refrigeration composition, which is carried out by forming a mixture of the polyols and then esterifying the mixture *in situ*, either with one carboxylic acid (or derivative thereof) or a mixture of mono- and dibasic acids. The process involves a single step esterification reaction, which results in a product with different characteristics than Nakahara et al. For example, the V_{40} and V_{100} values of 46.5 and 7.79 for Example J of Nakahara et al. differ from the V_{40} and V_{100} values of 23.69 and 5.06 for Sample 9 in the instant invention. The pour points of these two compositions also differ. The pour point for Example J of Nakahara et al. is less than 50°C, whereas the pour point for Sample 9 is -63°C. Accordingly, Applicants submit that the present invention is not anticipated by Nakahara et al. Reconsideration and removal of the rejection is requested.

Rejections Under 35 U.S.C. §103(a)

Claims 1-7 have also been rejected by the Examiner under 35 U.S.C. §103(a) as being unpatentable over Nakahara et al. The Examiner argues that it would have been obvious to a skilled artisan that all of the mixed ester oils claims in the instant invention fall within the disclosure of Nakahara et al. Applicants respectfully disagree. Nakahara does not disclose or suggest which particular combination of esters would yield the best refrigeration composition. As stated on page 1 of Applicants' Specification, the use of neopentylglycol (NPG) and pentaerythritol (PE) esters with refrigerants had previously been suggested as NPG and PE possess good solubility properties, good technical stability and

good cold properties. However, in practice, NPG and PE proved to have only fair solubility in non-chlorinated hydrofluorocarbons. Applicants have now surprisingly found that mixtures of esters comprising HPHP and other polyols, such as NPG, BEPD, ETHD, TMP, TME, PE, etc, exhibit good or excellent solubility in fluorinated refrigerants.

The non-obviousness of the present invention is evident from a comparison of the data presented in Tables 3 and 4 of the Specification on pages 10-11. Sample 4 of Table 3 shows that complex esters of HPHP with octanoic acid and adipic acid, in a 80:20 molar ratio, have a pour point of -51°C. There is, however, a distinct lowering of the pour point when HPHP is mixed with another polyol ester as can be seen in Samples 7 and 9 in Table 4. The complex ester in Sample 7, comprised of HPHP and BEPD, has a pour point of -54°C. The complex ester in Sample 9, comprised of HPHP and NPG, has a pour point of -63°C. Samples 7 and 9 illustrate that the pour point for the HPHP complex esters of Sample 4 is lowered by 3°C when the molar proportion of BEPD ester is 40% and by 12°C when the molar proportion of NPG ester is 40 mol% of the polyol ester mixture. Similar results can be observed when comparing solubility characteristics. The solubility of the Sample 4 HPHP ester in R134a at -30°C is "good", whereas the solubility of the mixed ester of HPHP and NPG in Sample 9 is "excellent".

Applicants have also found that the viscosity of the present esters can be adjusted by suitably selecting the esterifying carboxylic acid component of the complex esters. By feeding a dibasic carboxylic acid into the esterification reaction and, in particular, by using it together with linear or branched acids, the viscosity of the product can be increased without impacting the cold and solubility properties of the product. Particularly preferred HPHP complex esters, therefore, contain some 1 to 10 mol-% dibasic carboxylic acid and 90 to 99 mol-% linear and/or branched monobasic carboxylic acid, and complex esters of HPHP and other polyol esters contain about 4 to 30 mol-% dibasic carboxylic acid and 96 to 70 mol-% linear and/or branched monobasic carboxylic acid. The impact of the dibasic acid can be seen in the comparison of the esters in Tables 1 and 2 on page 8-9 of the Specification with those in Tables 3 and 4 on pages 10-11 of the Specification. There is no teaching or other indication in Nakahara that compositions with these improved characteristics could be obtained by mixing HPHP esters with other polyol esters. Therefore, Applicants argue that Nakahara does not render the present invention obvious. Removal and reconsideration of the rejection is respectfully requested.

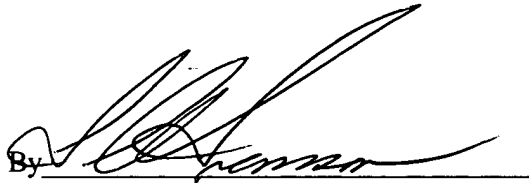
If the Examiner has any questions regarding this application, the Examiner is requested to contact Leonard R. Svensson, Reg. No. 30,330, at the telephone number of (714) 708-8555 in Southern California. Facsimiles may be sent to the attention of the undersigned at the facsimile number of (714) 708-8565.

Pursuant to 37 C.F.R. §§1.17 and 1.136(a), the Applicant respectfully petitions for a three (3) month extension of time for filing a response in connection with the present application and the required fee of \$890.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and further replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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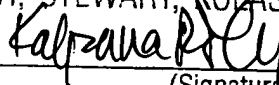
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June 6, 2001

(Date of deposit)

BIRCH, STEWART, KOLASCH & BIRCH, LLP



(Signature)

6/6/01

(Date of Signature)

MARKED UP VERSION OF THE CLAIMS

1. (Amended) Refrigerant composition comprising a chlorine-free hydrofluorocarbon based refrigerant and, mixed therewith, a lubricant containing a polyol ester, [characterized in that the] wherein said polyol ester comprises a mixture of [an ester of] 3-hydroxy-2,2-dimethyl-propyl-3-hydroxy-2,2-dimethyl-propionate (HPHP) and
 - an ester of trimethylol propane, trimethylol ethane, pentaerythritol or 2,2,4-trimethylpentadiol, the amount of the 3-hydroxy-2,2-dimethyl-propyl-3-hydroxy-2,2-dimethylpropionate being at least 50 mol-% of the polyol residue of the ester mixture,
 - an ester of 2-butyl-2-ethyl-1,3-propanediol, the molar ratio of the 2-butyl-2-ethyl-1,3-propanediol and the 3-hydroxy-2,2-dimethyl-propyl-3-hydroxy-2,2-dimethylpropionate being 5:95 - 99:1, or
 - a polyol ester of neopentylglycol, 2-ethyl-1,3-hexanediol or 1,4-dimethylol-cyclohexane.

3. (Amended) The refrigerant composition according to claim 1 or claim 2, wherein the carboxylic acid residue of the polyol ester is derived from a linear or branched C₄[. . .]-C₁₈-carboxylic acid, or anhydrides thereof, or it is derived from a mixture of linear or branched C₄[. . .]-C₁₈-carboxylic acid, or anhydrides thereof.

7. (Amended) The refrigerant composition according to claim 5 or claim 6, wherein the dibasic carboxylic acid residue is derived from oxalic acid, malonic acid, dimethylmalonic acid, succinic acid, glutaric acid, adipic acid, sebacic acid, pimelic acid, suberic acid, [or] azelaic acid, [or] a cyclic anhydride [such as succinic anhydride] or an alkyl derivative thereof, or trimellitic anhydride.

8. (Amended) The refrigerant composition according to [any of claims 5 to 7] claim 5, wherein the molar ratio between the mono- and dibasic carboxylic acids is 50:50 to 95:5.

9. (Amended) The refrigerant composition according to [any of the preceding claims] claim 1, wherein the fluoroinated hydrocarbon based refrigerant is hydrofluorocarbon 134, hydrofluorocarbon 134a, hydrofluorocarbon 143, hydrofluorocarbon 143a, hydrofluorocarbon 152, [or] hydrofluorocarbon 152a or a mixture [of hydrofluorocarbons] thereof.